

the overflow of many streams, and the destruction of mill and other property in New England, New Jersey, and Delaware.

STAGE OF WATER IN RIVERS AND HARBORS.

The following table shows the danger-points at the several stations; the highest and lowest water during November, 1889, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, Nov., 1889, (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, La.....	29.9		30	5	5.4	12.4
<i>Arkansas River:</i>						
Fort Smith, Ark....	22.0		28	2	1.6	8.0
Little Rock, Ark....	23.0		30	1	3.0	11.3
<i>Missouri River:</i>						
Fort Buford, Dak.....		15	1.1	7, 12, 13, 14	—0.3	1.4
Kansas City, Mo....	21.0	11	6.4	29	4.2	2.2
<i>Mississippi River:</i>						
Saint Paul, Minn....	14.5	5	1.9	24	1.1	0.8
La Crosse, Wis....	24.0	3.4	1.9	1, 8—12, 20, 21	1.7	0.2
Dubuque, Iowa....	16.0	13	2.0	4, 5, 29, 30	1.6	0.4
Davenport, Iowa....	15.0	12—16, 23, 24	0.9	30	0.6	0.3
Keokuk, Iowa....	14.0	10—12	0.4	5, 6, 7, 8, 29, 30	0.0	0.4
Saint Louis, Mo....	32.0	14	10.6	1	3.7	6.9
Cairo, Ill.....	20.0	23	28.9	1	4.2	24.7
Memphis, Tenn....	34.0	25	22.5	1, 2, 3	3.2	19.3
Vicksburg, Miss....	41.0	30	26.0	1, 2	—0.8	26.8

Heights of rivers—Continued.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Miss R.—Cont'd.</i>						
New Orleans, La. . .	13.0	30	7-2	5	2.3	4.9
<i>Ohio River</i>						
Pittsburgh, Pa. . . .	22.0	10	14.4	2	4.5	9.9
Parkersburg, W. Va. .	38.0	26	19.5	3	8.1	11.4
Cincinnati, Ohio . . .	50.0	28	33.6	1	13.2	20.4
Louisville, Ky.	25.0	28	12.9	1	6.0	6.9
<i>Cumberland River:</i>						
Nashville, Tenn. . . .	40.0	19	24.7	5	4.1	20.6
<i>Tennessee River:</i>						
Chattanooga, Tenn. . .	33.0	11-21	11.3	1, 2	2.7	8.6
<i>Monongahela River:</i>						
Pittsburgh, Pa.	29.0	10	14.4	2	4.5	9.9
<i>Savannah River:</i>						
Augusta, Ga.	32.0	22	17.1	3-10	6.8	10.3
<i>Willamette River:</i>						
Portland, Oregon . . .	15.0	27, 28, 29	4.3	19	0.3	4.0

The Signal Service observer at Fort Sully, S. Dak., reports, under date of the 20th, that the water in the Missouri River at that place was lower than it had been at any time during the last eighteen years, and that navigation was suspended in consequence. At Chattanooga, Tenn., navigation was opened on the Tennessee River on the 4th, and driftwood was floating in the river on the 10th and 11th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Well-defined auroral displays were noted at Fort Buford, N. Dak., on the 1st; at Moorhead, Minn., Marquette, Mich., Northfield, Vt., and Eastport Me., on the 17th; at Fort Buford, N. Dak., Eastport and Portland, Me., and Northfield, Vt., 26th.

Fort Buford, N. Dak.: an aurora was first observed at 12.08 a. m., 1st; it consisted of a well-defined arch of yellowish light, which rose to about altitude 45°, the centre of which extended over about 70° between the northwest and northeast; beneath the arch was a diffused gray light, covering the space between the horizon and the arch. The lower portion of the aurora was partly obscured by stratus clouds. The maximum intensity occurred at 1.46 a. m., after which the arch gradually disappeared, and at 2.22 a. m. the display had entirely vanished. Auroral streamers, rising to altitude 60°, were observed in the north and northeast between 10.05 p. m. and 10.52 p. m., the same date. Another auroral display occurred on the evening of the 26th. It was first observed at 10.08 p. m., and consisted of a feeble gray light in the form of an arch, the western portion of which was about 30° above the horizon, from which point it extended eastward in a gradual slope, covering about 130° of the horizon. The display lasted until dawn of the 27th.—*Report of A. Schneider, observer, Signal Corps.*

Moorhead, Minn.: a faint auroral display was observed at 8.30 p. m., 17th. It consisted of a steady white arch of light, extending from azimuth 170° to 220°; the altitude of which was about 15°. The aurora continued as described until daylight of the 18th.—*Report of S. L. Dosher, observer, Signal Corps.*

Marquette, Mich.: an aurora was observed at 7.30 p. m., 17th. It consisted of a pale white arch, extending from north-northwest to north-northeast, from which at 8.40 p. m. streamers rose to a height of about 50°. The display was of ordinary brilliancy and ended at 11 p. m.—*Report of Wm. H. Andy, observer, Signal Corps.*

Eastport, Me.: a faint auroral arch was observed a 7.45 p. m., 17th. It extended from northeast to a little west of north and to altitude 10°. The aurora extended farther westward and attained its maximum brilliancy at 9.30 p. m., when beams of light rose to near the zenith. At 9.50 p. m. the aurora consisted of a well-defined arch of altitude 15°, and had entirely disappeared at midnight. Another auroral arch of altitude 15° was observed at 5.30 p. m., 26th; it remained faint until

6.30 p. m., when it appeared to separate into two arches, the upper one having an altitude of 12° and the lower an altitude of 8°; the upper extending from northeast to northwest. At 6.35 p. m. the display was quite brilliant, and shafts of light were shooting up from all parts of the arch. At 8 p. m. the arch was well defined and attained an altitude of 30°, extending from east-northeast to northwest. The display ended at 11 p. m.—*Report of D. C. Murphy, observer, Signal Corps.*

Northfield, Vt.: a faint auroral display was observed at 7.45 p. m., 17th. It consisted of a white light extending from azimuth 180° to 225°. At 7.55 p. m. the light had moved towards the east, its position being then from azimuth 215° to 235° and altitude 15°, with occasional streamers which rose to about 30° above the horizon. The display ended at 9 p. m. Another auroral arch was observed between 7.30 p. m. and 9 p. m., 26th, its color being similar to the morning dawn. The arch extended from azimuth 135° to 225° and to altitude 35°, with numerous small clouds in the upper portion of the arch.—*Report of William Line, observer, Signal Corps.*

Portland, Me.: an auroral arch was observed at 7.45 p. m., 26th. The arch was moderately luminous and fairly defined; it extended from about azimuth 158° to 202° and to altitude 12°. The arch gradually faded away at about 9.30 p. m.—*Report of N. D. Lane, observer, Signal Corps.*

Auroras were observed during the month as follows: 1st, Fort Buford, Leech Farm, and New England City, N. Dak.; Webster, S. Dak. 2d, Egg Harbor City, N. J.; South Canisteo, N. Y. 5th, 6th, and 8th, Huron, S. Dak. 11th, Princeton, Ind. 14th, 15th, Webster, S. Dak. 16th, Cornish, Me.; Leech Farm, N. Dak.; Yaukton, S. Dak. 17th, Southington, Conn.; Leicester, Mass.; Cornish, Eastport, and Orono, Me.; Marquette, Mich.; Montevideo, Moorhead, and Pine River, Minn.; Glendive, Mont.; Spencerport and Wedgwood, N. Y.; Leech Farm and New England City, N. Dak.; Webster, S. Dak.; Northfield, Vt. 18th, Cornish, Me.; Montevideo, Minn.; Nashua, N. H.; Leech Farm, N. Dak. 19th, Ilion, N. Y. 20th, Farmington and Orono, Me. 21st, Orono, Me. 24th, Ozark, Mo. 25th, Orono, Me. 26th, Kootenai, Idaho; Eastport and Portland, Me.; Leicester and Newburyport, Mass.; Glendive, Mont.; Egg Harbor City, N. J.; Nashua, N. H.; Ardenia, Honey Mead Brook, and Queensbury, N. Y.; Fort Buford, N. Dak.; Huron, Kimball, and Wolsey, S. Dak.; Northfield, Vt.

27th, Postdam, N. Y.; Wolsey, S. Dak. 28th, Webster, S. Dak.; Hartland, Vt. 29th, Ardenia, N. Y.; Leech Farm and Wapeton, N. Dak.; Webster, S. Dak.; Newburyport, Mass. 30th, Manitowoc, Wis.

THUNDER-STORMS.

No severe thunder-storms were reported during the month. Thunder-storms were reported in the greatest number of states and territories, ten, on the 1st and 27th; in six on the 20th, 21st, and 25th; in from one to five, inclusive, on the 2d to 9th, 11th, 12th, 15th to 19th, 22d, 23d, 24th, 26th, 28th, 29th, 30th.

The 10th, 13th, and 14th were the only dates on which no thunder-storms were reported.

Thunder-storms were reported on the greatest number of dates, thirteen, in Texas; on nine in Louisiana; on six in Kansas; and on from one to five, inclusive, in Alabama, Arkansas, California, District of Columbia, Florida, Georgia, Illinois, Indiana, Indian Territory, Maryland, Mississippi, Missouri, Montana, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, and Washington. In states and territories other than those named above no thunder-storms were reported.

MISCELLANEOUS PHENOMENA.

PRAIRIE FIRES.

Prairie fires were reported as follows: Fort Reno, Ind. T., 10th, 13th, 17th, 18th 21st, 22d, and 23d; Fort Sill, Ind. T., 13th to 16th and 18th to 23d, inclusive; Rhome, Tex., 19th; Sacramento, Cal., brush fires, 2d.

HALOS.

Solar halos were most frequently reported in Illinois, where they were noted on ten dates; in Tennessee on eight dates; in Missouri, on seven dates; in Minnesota, New York, and Ohio, on six dates; and on from one to five dates, inclusive, in Arizona, Arkansas, California, Colorado, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Nebraska, Nevada, New Jersey, North Carolina, North Dakota, Pennsylvania, South Carolina, South Dakota, Utah, Virginia, and Washington. In states and territories other than those named no solar halos were reported. They were reported in the greatest number of states and territories, nine, on the 5th and 26th; in seven on the 7th; in six on the 15th; and in from one to five, inclusive, on the 1st to 4th, 6th, 8th to 14th, 16th, 18th to 21st, 23d, 24th, 25th, 27th to 30th. No solar halos were reported on the 17th and 22d.

Lunar halos were most frequently reported in Nevada, where they were noted on fourteen dates, and in California on twelve dates; on from six to nine dates, inclusive, in Illinois, Iowa, Michigan, Montana, Nebraska, Oregon, South Carolina, South Dakota, Tennessee, and Virginia; and on from one to five dates, inclusive, in Alabama, Arizona, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Indiana, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Texas, Utah, Vermont, Washington, Wisconsin, and Wyoming. In states and territories other than those mentioned, no lunar halos were reported. They were reported in the greatest number of states and territories, sixteen, on the 6th and 7th; in from eleven to fifteen, inclusive, on the 1st, 4th, 10th, 11th, and 29th; in from six to ten, inclusive, on the 2d, 3d, 5th, 8th, 9th, 12th, 27th, 28th, and 30th; and in from one to four, inclusive, from the 13th to 19th, and 26th. For dates other than those named no lunar halos were reported.

METEORS.

The distribution of meteors, by dates, was as follows: 1st, Richmond, Ind. 2d, Elyria and Westerville, Ohio. 3d, Auburn, Ala.; Villa City, Fla. 4th, Auburn, Ala.; North Sutton, N. H.; Setauket, N. Y.; Pittsburgh, Pa. 6th, New Castle, Pa. 8th, Whipple Barracks, Ariz. 10th, Vevay, Ind.; Webster City, Iowa; Alpena, Mich.; Egg Harbor City, N. J.; Quakertown, Pa. 11th, Statesburgh, S. C. 13th, Villa City, Fla.; Rolling Green, Minn.; Spearfish, S. Dak. 14th, Little Rock, Ark.; Red Bluff, Cal.; Villa City, Fla.; Barren Creek Springs, Md.; Quakertown, Pa.; Spearfish, S. Dak. 15th, Red Bluff, Cal.; State College, Pa. 16th, Kootenai, Idaho; Mount Saint Mary's, Md.; Woodbury, N. J.; Webster, S. Dak. 17th, Orono, Me.; Taunton, Mass. 18th, Bendena, Kans. 20th, Egg Harbor City, N. J. 22d, Villa City, Fla.; Uni-

versity, Miss.; Statesburgh, S. C.; Nashville and Riddleton, Tenn. 23d, Yates Centre, Kans.; Egg Harbor City, N. J.; Fort Washakie, Wyo. 24th, Webster City, Iowa; Factoryville, N. Y.; Centre Valley, Pa.; Spartanburgh, S. C. 25th, Berkeley, Cal. 28th, River Side, Cal.; Clinton, Iowa. 29th, Villa City, Fla.; Hilton, Ill.; North Sutton, N. H.; Albany, Oregon.

Elyria, N. Y.: a very large and brilliant meteor, about the apparent size of Jupiter, was observed at 6.15 p. m., 2d. It came from the southwest, and when near the ground it broke, sending out a shower of sparks.—*Report of Chas. W. Goodspeed, voluntary observer.*

Alpena, Mich.: a brilliant meteor was observed at 6.50 p. m., 10th. It passed across the sky from south to north about 30° above the horizon, and was visible about twelve seconds.—*Report of James J. Fitzgerald, observer, Signal Corps.*

Little Rock, Ark.: two very brilliant meteors were observed on the evening of the 14th. Both were moving from south to north, leaving trails of light in their paths.—*Report of W. U. Simons, observer, Signal Corps.*

Fort Sully, S. Dak.: a brilliant meteor was observed at 8.30 p. m., 17th. It dropped from altitude 10° and azimuth 135° below the horizon. The meteor appeared quite near, and illuminated the western sky with a distinct red light. Another brilliant meteor was observed in the eastern sky, passing from about altitude 25° to 15°, at 7.40 p. m., 30th, leaving a distinct trail in view.—*Report of I. G. Gardiner, observer, Signal Corps.*

Yates Centre, Kans.: a meteor was observed at 5.20 a. m., 23d, in azimuth 165°, altitude 45°. It passed diagonally toward the northeast, and disappeared in azimuth 190°, altitude 35°. It was of a pale yellow color, and left a quickly-vanishing trail.—*Report of Mr. F. R. Gray, voluntary observer.*

Berkeley, Cal.: a meteor of medium brightness was observed on the 25th, at 8.40 p. m. It started in the eastern sky and moved south at an angle of 40°. It was of short duration, and moved slowly.—*Report of Mr. Carl Rabe, voluntary observer.*

Palestine, Tex.: a brilliant meteor, moving from east to west, was observed in the northern sky at 11.15 p. m., 27th. It travelled about 25° before disappearing.—*Report of H. H. Curley, observer, Signal Corps.*

MIRAGE.

Mirage were observed as follows: 5th, Rolling Green, Minn.; 7th, Saint Vincent, Minn.; 8th, Kimball and Woonsocket, S. Dak.; 9th, Paoli, Colo., Webster, and Woonsocket, S. Dak.; 14th, Paoli, Colo.; 16th, Paoli, Colo., New England City, N. Dak.; 17th, New England City, N. Dak.; 18th, Yuma, Ariz., New England City, N. Dak., Kimball, S. Dak.; 19th, Kimball and Webster, S. Dak.; 22d, Paoli, Colo.; 25th, Yuma, Ariz., Bancroft, Iowa, Rolling Green, Minn., Kimball, S. Dak., San Diego, Cal.; 27th, Yuma, Ariz.

Saint Vincent, Minn.: a mirage was observed at 8 a. m., 7th. The towns of Hamilton and Bathgate, N. Dak., distant, respectively, eighteen and twenty-three miles from this place, were plainly seen. The buildings in each town were distinctly presented to view, as if seen from an adjacent eminence. A train of freight cars on the side track at Hamilton, and the